

**What is claimed is:**

- 1) A reinforced, coal-based cellular shape comprising a matrix of cells of the same or different density or size reinforced with at least one layer of a fibrous carbonaceous mat.**

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- 2) The reinforced, coal-based cellular shape of claim 1 wherein said matrix is prepared from bituminous coal.**

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- 3) The reinforced, coal-based cellular shape of claim 2 wherein said bituminous coal has a swell index of between about 3.5 and about 5.**

- 4) The reinforced, coal-based cellular shape of claim 3 wherein said bituminous coal has a swell index of between about 3.75 and about 4.5.**

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- 5) The reinforced, coal-based cellular shape of claim 4 wherein said bituminous coal has a swell index of about 4.**

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- 6) The reinforced coal-based cellular shape of claim 2 wherein said bituminous coal has a Gieseler plasticity value above about 500DDPM.**

- 7) The reinforced, coal-based cellular shape of claim 1 wherein said at least one layer of fibrous carbonaceous mat defines stiffeners, load paths, directed heat transfer paths and/or directed mass transfer paths that are**

due to the presence of coal-based cells of a structure differing from those comprising the matrix.

5 8) The reinforced, coal-based cellular shape of claim 1 wherein said at least one layer of fibrous carbonaceous mat defines stiffeners or load paths, directed heat transfer paths and/or directed mass transfer paths that are due to the presence of coal-based cells of different densities than those comprising the surrounding matrix.

10 9) The reinforced, coal-based cellular shape of claim 3 wherein said at least one layer of fibrous carbonaceous mat defines stiffeners, load paths, directed heat transfer paths or directed mass transfer paths that are defined by the presence of coal-based structure of a higher density or greater cell wall thickness than that of the surrounding matrix.

15 10) The reinforced, coal-based cellular shape of claim 3 wherein said fibrous, carbonaceous mat comprises a member selected from the group consisting of: continuous fiber, non-woven, two dimensional mat of random in-plane fiber orientation; chopped fiber, non-woven, two  
20 dimensional mat of random in-plane fiber orientation; two dimensional woven or knitted mat; a prepeg of continuous unidirectional roving with appropriate resin or filler material formed into a two dimensional sheet, and combinations thereof.

11) The reinforced, coal-based cellular shape of claim 1 comprising a plurality of said layers of fibrous carbonaceous mat interleaved with layers of said matrix of cells.

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12) The reinforced, coal-based cellular shape of claim 1 wherein said at least one layer of fibrous carbonaceous mat comprises a non-planar geometric shape.

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13) The reinforced, coal-based cellular shape of claim 1 wherein said at least one layer of fibrous carbonaceous mat comprises a resin impregnated fibrous mat.

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14) The reinforced, coal-based cellular shape of claim 13 wherein said at least one layer of fibrous carbonaceous mat comprises a resin impregnated fibrous mat face sheet.